REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Applicants respectfully request that the Information Disclosure Statement (IDS) filed on March 29, 2001, be acknowledged. For the Examiner's convenience, a copy of the IDS is enclosed with this response.

Claims 1-20 are pending in the present application; Claim 19 is amended; and Claim 20 is added by the present amendment. Support for new Claim 20 can be found in the original specification, claims, and drawings.[1] Thus, no new matter is presented.

By way of summary, the Official Action presents the following issues: Claims 1-5, 13 and 18-19 were rejected under 35 U.S.C. § 102(e) as anticipated by Nishiwaki (U.S. Patent No. 6,198,846, hereinafter Nishiwaki); and Claims 6-12 and 14-17 were objected to as dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claims.

Applicant appreciatively acknowledges the indication of allowable subject matter. However, since Applicant considers that the independent Claims 1, 13, 18 and 19 patentably define over the prior art, the remaining dependent claims have been presently maintained in dependent form.

The claims as currently written relate to a character recognition method that uses a function for recognizing a character string by appropriately extracting and recognizing a contacting character, a separated character, and the like. Generally, when extracting characters, the extraction accuracy differs depending on whether (i) a shared (common or joint) portion is not permitted between adjacent contacting characters or (ii) a shared (common or joint) portion is permitted between adjacent contacting characters. The

[1] Specification e.g., at page 88, lines 6-23.

extraction by process (i) is likely to result in extracted characters having contours that are unnatural, not smooth, or generally inaccurate.

The present application relates to a method analogous to that described by process (ii). More specifically, a virtual boundary point sequence is used to appropriately extract adjacent or contacting characters of a character string. It is possible to separate a contacting character by generating the virtual boundary point sequence with respect to a singular region of a cross section sequence graph. A separated character is subjected to the character recognition by being described by the virtual boundary point sequence and a boundary point sequence. The virtual boundary point sequence is created by a smooth curve, thereby improving the recognition accuracy of the character recognition.[2]

Claim 1 recites, *inter alia*, a character recognition method, comprising the steps of:

> ...(a) extracting the cross section sequence graph from a character string image;
> (b) analyzing a singular region of the cross section sequence graph and generating a virtual boundary point sequence in the singular region based on an analyzed result;
> (c) generating character candidates by combining structural elements of the cross section sequence graph and recognizing one character by supplying the virtual boundary point sequence with respect to the generated character candidates if necessary; and
> (d) recognizing a character string based on an adjacency relationship of the character candidates which are recognized as one character in said step (c).

Nishiwaki corresponds to the process (i) described above by proposing a character recognition system using a vertical run line.[3] Nishiwaki uses a separation shape determining means to determine which of the separated character candidate patterns matches the shape of the character separation at the detected separation position.[4] Thus, in Nishiwaki, it is essential to register the verification rule in a verifying rule memory means 52.[5] For this

[2] Specification at page 4, lines 10-25.
[3] Nishiwaki at column 5, lines 49-51.
[4] Nishiwaki at Figure 1, and column 4, lines 36-39.
[5] Nishiwaki at Figure 1.

reason, it is only possible to process connections conforming to the registered verifying rule, such as three-point connection and four-point connection, and it is difficult to process a connection having an arbitrary shape.

Nishiwaki is also limited to the processing of two characters. Nishiwaki indicates that only the left side recognition result and the right side recognition result are used to determine the identity of the two figures.[6] Moreover, although Nishiwaki describes detecting the continuous character pixel areas using labeling, such detection can only be made when the number of characters is known, and Nishiwaki uses labeling by knowing that there are only two characters to be recognized.[7]

The Outstanding Official action asserts that Nishiwaki teaches all the elements of Claim 1. Applicant respectfully traverses this rejection.

The Official Action states that "extracting a character row" is analogous to "extracting the cross section sequence graph from a character string," as recited in Claim1. Applicant respectfully traverses this assertion. Nishiwaki describes obtaining a "projection", and that a character string is extracted from the scanned image.[8] Therefore, Nishiwaki merely extracts the character string, and fails to teach or suggest "(a) extracting the cross section sequence graph from a character string image," as recited in Claim 1. It should be noted that the "cross section sequence graph" is defined in greater detail in the present specification and does not constitute the "extracting of a character row" as described by Nishiwaki.[9] Thus, Nishiwaki fails to teach or suggest a "cross section sequence graph," or the extraction of such a graph as recited in Claim 1.

The Official Action also states that "analyzing a singular region of the cross-section and generating a virtual boundary point in the singular region," as recited in Claim 1, is

[6] Nishiwaki at Figures 16-17.
[7] Nishiwaki at column 5, lines 35-47.
[8] Nishiwaki at column 5, lines 17-33.
[9] Specification at page 16, line 20 - page 17, line 5.

analogous to "merely focusing on a specific part of a region, separating of position candidates and determining the shapes at the detected row separating position candidates." Applicants respectfully disagree. Nishiwaki describes separating the characters in units of pixels (using a vertical run line) horizontally and processing connections conforming to the registered verifying rule.[10] Thus, Nishiwaki fails to teach or suggest "(b) analyzing a singular region of the cross section sequence graph and generating a virtual boundary point sequence in the singular region based on an analyzed result," as also recited in Claim 1.

Claim 1 further recites "generating character candidates by combining structural elements of the cross section sequence graph and recognizing one character by supplying the virtual boundary point sequence with respect to the generated character candidates." In response to this claim limitation, the Official Action asserts that Nishiwaki describes "generating character candidates are provided in character candidate separation, wherein from the extracted row one character is recognized." Thus, Nishiwaki merely generates the character candidates by separating the characters in units of pixels (using a vertical run line) directed horizontally. This method is in contrast to the claimed invention, which generates character candidates by "combining structural elements of the cross section sequence graph," as recited in Claim 1.

Accordingly, Applicant respectfully requests that the rejection of Claim 1 under 35 U.S.C. § 102(e) be withdrawn. For substantially the same reasons as given with respect to Claim 1, it is also submitted that Claims 13 and 18-20 patentably define over Nishiwaki.

Claims 2-5 were also rejected under 35 U.S.C. § 102(e), as being anticipated by Nishiwaki. Applicant respectfully traverses this rejection.

[10] Nishiwaki at column 7, lines 22-47.

As discussed above, Nishiwaki fails to teach or suggest the use of a virtual boundary point sequence as recited in Claim 2. Accordingly, Applicant respectfully requests that the rejection of Claim 2 under 35 U.S.C. § 102(e) be withdrawn.

Claim 3 recites "determining a generating position of the virtual boundary point sequence based on the singular region and a connecting sequence and positions of cross section sequences connecting to the singular region." In response, the Official Action states that Nishiwaki describes the separation shapes of the separated character patterns. However, the Official Action appears to confuse the "position" which refers to the ordinate of the vertical run line coordinate in Nishiwaki, but refers to either of the two boundary points of the first cross section of the cross section sequence in the present invention. Hence, it is submitted that Claim 3 patentably defines over Nishiwaki.

Regarding Claims 4 and 5, Nishiwaki fails to teach or suggest the virtual boundary point sequence as discussed above, and as recited in Claims 4 and 5. Thus, it is also believed that Claim 5 is allowable over Nishiwaki.

Accordingly, it is respectfully submitted that Claims 2-5 patentably define over Nishiwaki.

Consequently, in view of the present amendment and in light of the foregoing comments, it is respectfully submitted that the invention defined by Claims 1-20 is patentably distinguishing over the prior art. The present application is therefore believed to be in condition for formal allowance and an early and favorable reconsideration of the application is therefore requested.

Respectfully submitted,

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